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WEAPONS
(MARINE INFANTRY BATTALION)

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PART IV.—RIFLE GRENADES AND GRENADE LAUNCHERS

1. **General.**—New developments in rifle grenades and grenade launchers are as follows:

a. The grenade launcher M7, for firing rifle grenades from the U.S. Rifle, Caliber .30, M1, using the .30-caliber rifle grenade cartridge M3 as the means of propulsion.

b. The grenade launcher M8, for firing rifle grenades from the U.S. Carbine, Caliber .30, M1, M1A1, or M1A2, using the carbine cartridge M6 as the means of propulsion.

c. The grenade projection adapter, M1, for projecting the standard Mk. II fragmentation hand grenade by means of the rifle or carbine.

d. The impact fragmentation rifle grenade, M17.

e. Ground signals (which can be fired from grenade launchers) of the following types and models:

Signal, ground, white star, parachute, M17A1.
Signal, ground, white star, cluster, M18A1.
Signal, ground, green star, parachute, M19A1.
Signal, ground, amber star, parachute, M21A1.
Signal, ground, amber star, cluster, M22A1.
Signal, ground, red star, parachute, M51A1.
Signal, ground, red star, cluster, M52A1.

f. The grenade launcher sight.

2. **Grenade Launcher M7.**—a. This launcher is capable of firing the AT grenades M9 and M9A1, the AT practice grenades M11 and M11A1, and the rifle practice grenade M11A2 (see text, pages 87-88), in addition to those mentioned above.

b. Provided with the launcher is a valve screw which must be inserted in the gas cylinder of the rifle in place of the regular gas cylinder lock screw. The launcher is secured to the rifle by the latch which clamps in back of the bayonet lug. A stud on the launcher protrudes into the valve screw when the launcher is assembled. The launcher body has six graduations for different ranges. A grenade retainer spring, slightly larger in diameter than the launcher body, serves to hold the grenade in its proper position on the launcher.

c. Service ammunition from the cartridge clip may be fired in the rifle with the launcher in place; however, because the valve remains open, the rifle can be operated only as a single-shot weapon, and the bolt must be operated by hand. If the launcher is removed and a round of service ammunition fired, the valve will ordinarily close by itself and the weapon will then function semiautomatically.

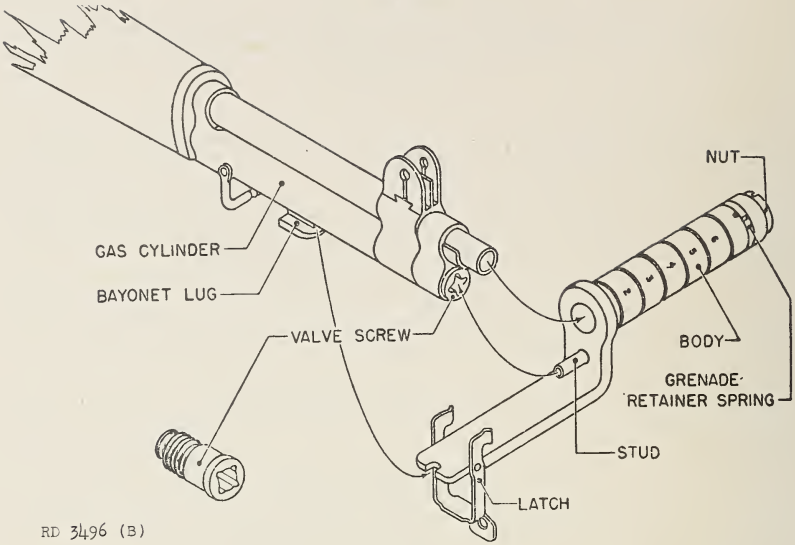

Figure 51.—Grenade Launcher M7 and Caliber .30 Rifle M1.

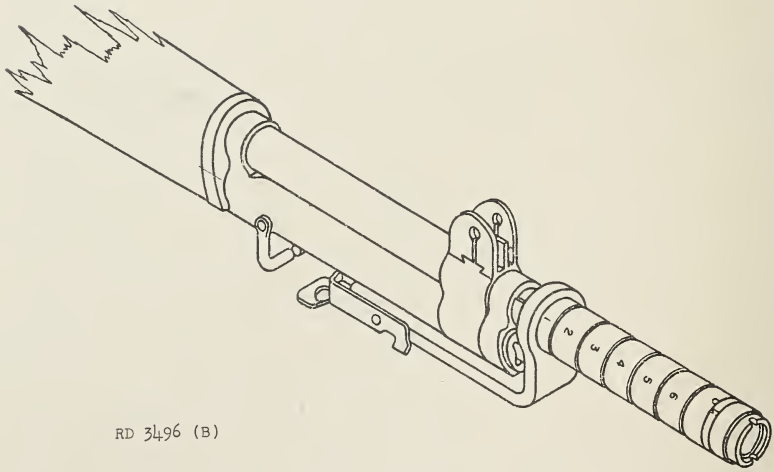

Figure 52.—Launcher M7 Assembled to Caliber .30 Rifle M1.

3. **Grenade Launcher M8.**—a. This launcher is used to fire rifle grenades from the M1, M1A1, and M1A2 .30-caliber carbines, using the carbine grenade cartridge M6 as the means of propulsion. The carbine with launcher attached will fire AT grenades M9 and M9A1, AT practice grenades M11 and M11A1, practice rifle grenade M11A2, the rifle impact fragmentation grenade M17 (formerly the T2), and the standard Mk. II fragmentation grenade with adapter M1. It will also fire ground signals modified for projection from grenade launchers (paragraph 1-e).

b. The launcher is an extension to the barrel of the carbine. It is secured to the carbine by the clamp with wing nut which fastens around the barrel in rear of the front sight. When assembling the grenade launcher M8 to the carbine, care must be taken to insure that the launcher is firmly attached, otherwise it may slip off during firing.

The launcher body has six graduations for different ranges. Maximum range can be obtained by placing the grenade at the No. 1 position on the launcher and the shortest range by placing the grenade at the No. 6 position. A grenade retainer spring, slightly larger in diameter than the launcher body, serves to hold the grenade in its proper position on the launcher and prevents the grenade from sliding off.

c. Service ammunition may be fired from the magazine with the launcher in place. The firer should first make certain that a grenade is not assembled to the launcher, then check the wing nut on the launcher to make certain that it is tight. The carbine may then be loaded and fired in the normal manner.

4. **General Employment of Grenade Launchers.**—The employment of the M7 and M8 launchers and the method of firing is the same as that of the M1 launcher (used on the M1903 Rifle) which is described in the text, pages 90 and 91. The range obtained depends upon how far back the grenade is placed on the launcher and the angle of elevation of the rifle. Under conditions of extreme darkness the gunner can adjust for range by feeling the rings on the launcher. The range for AT grenades is varied only by changing the angle of elevation; this grenade is always placed as far back on the launcher as possible, to give it maximum velocity. In firing fragmentation

Figure 53.—Grenade Launchers M7 and M8, Attached, with Rifle Grenades, AT and Smoke.

grenades, the range is determined by the position of the grenade on the launcher; an angle of approximately 45 degrees is used for most ranges. Range tables are furnished which show the angles of elevation and the ring number on the launcher for various ranges, along with the time of flight for each combination.

5. Grenade Projection Adapter, M1.—This adapter consists of a stabilizer and fin assembly to which is attached four spring-steel fingers. It is designed to project the standard fragmentation hand grenade by means of the rifle or carbine. The hand grenade is assembled to the adapter with the fingers engaging the grooves in the grenade body. An arming clip on the adapter holds the safety lever of the grenade until the grenade is fired, when the arming clip is removed by setback. The grenades are fired in the same manner as the AT grenades.

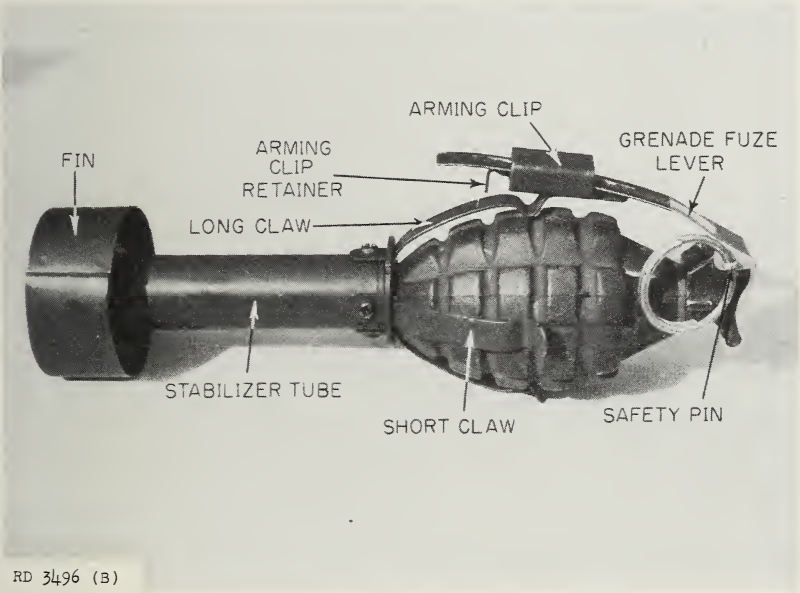

Figure 54.—Grenade Projection Adapter M1 With Fragmentation Hand Grenade Mk. II.

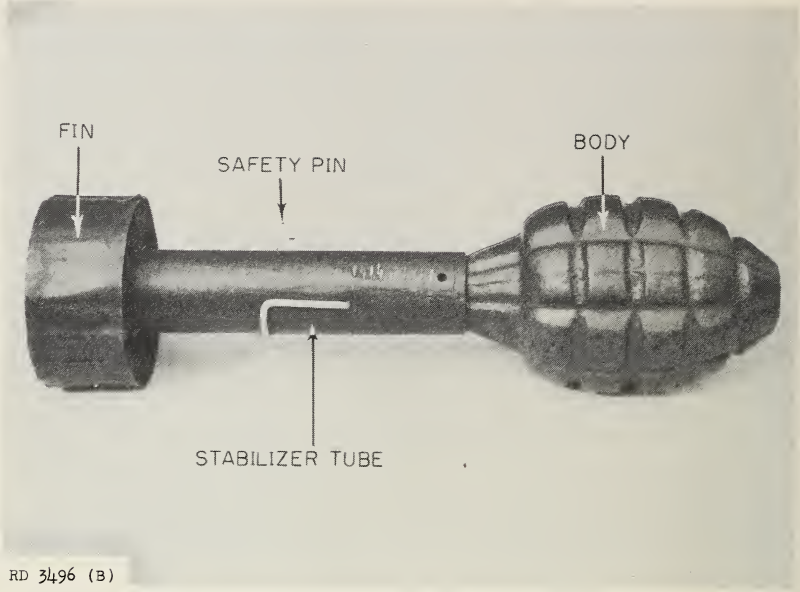

Figure 55.—Impact Fragmentation Rifle Grenade M17.

6. **Impact Fragmentation Rifle Grenade, M17.**—This grenade consists of a fragmentation type body similar to the Mk. IIA1 hand grenade assembled to a fuze and stabilizer assembly similar to that for the AT and practice rifle grenades. It will explode on any impact sufficient to retard its flight sharply. It may not function on graze impact or on impact with water. The same sequence of operations is used in firing the impact grenade as for other rifle grenades. The effective bursting radius is the same as for the fragmentation hand grenade. Range depends principally upon the distance to which the grenade is placed on the launcher.

7. **Ground Signals.**—Ground signals which have been adapted for firing from grenade launchers are designated by A1 model numbers (see paragraph 1-e above). The signals are packed with the stabilizer assembly closed by a cork plug and with the special blank cartridge attached to the cork by a metal clip. The signal is fired in the same manner as the rifle grenade, except that it is fired almost vertically upward. The case rises to a height of approximately 600 feet where the signal assembly is ejected and burns according to type. Care should be exercised to fire the signal so that the case will not fall on friendly troops. Signals should be especially protected against moisture and should not be stored with other types of ammunition.

8. **Grenade Launcher Sight.**—The angle of elevation of the weapon used to launch the grenades may be estimated by eye. If more accuracy is desired, a special sight, consisting essentially of a sight bar, a degree scale, and a leveling bubble, may be attached to the left side of the stock. The sight may be used on the Carbine, the M1, M1903, and M1903A3 rifles. A mounting plate is screwed on, centered 17½ inches from the butt; a locating jig is provided to give the proper location of the screw holes. When needed, the sight may be attached to this plate in one quick, simple operation.

RD 3496 (B)

Figure 56.—Grenade Launcher Sight With Carrying Pouch and Mounting Plate.

SECTION 17

2.36-INCH AT ROCKET LAUNCHER M1A1

1. **General.**—The rocket launcher, or "Bazooka," as it is better known, forms the principal element of defense in the rifle company against tanks and armored vehicles, and has proven to be highly effective for the close-in assault of fortified positions such as pill boxes and emplacements made of concrete and steel or other permanent material.

2. **Essential Characteristics.**—a. **Description.**—The 2.36-inch AT Rocket Launcher M1A1 is a smooth bore, electrically operated weapon of the open tube type, with a stock which houses the electrical firing mechanism. It is fired from the shoulder in the standing, kneeling, sitting, or prone positions. When fired, gases formed by the ignition of the propelling charge are able to escape through the rear of the tube while most of the force pushes forward to drive the rocket out the muzzle of the tube; this feature eliminates recoil.

An earlier model, the M1, had two hand grips; the M1A1 has but one, consisting of trigger grips attached to the trigger support. The M1A1 also has a conical wire screen mounted on the front, known as a flash deflector, a carrying sling, and a face guard, features not found on the M1 launcher.

b. **General data.**—

Weight of launcher (approx.)	(pounds)	13.26
Length of launcher (approx.)	(inches)	54.5
Internal diameter of launcher	(inches)	2.37
Weight of rocket (approx.)	(pounds)	3.5
Length of rocket (approx.)	(inches)	21.6
Muzzle velocity	(feet per second)	265
Maximum effective range	(yards)	300
Maximum range	(yards)	700
Sights graduated to	(yards)	300

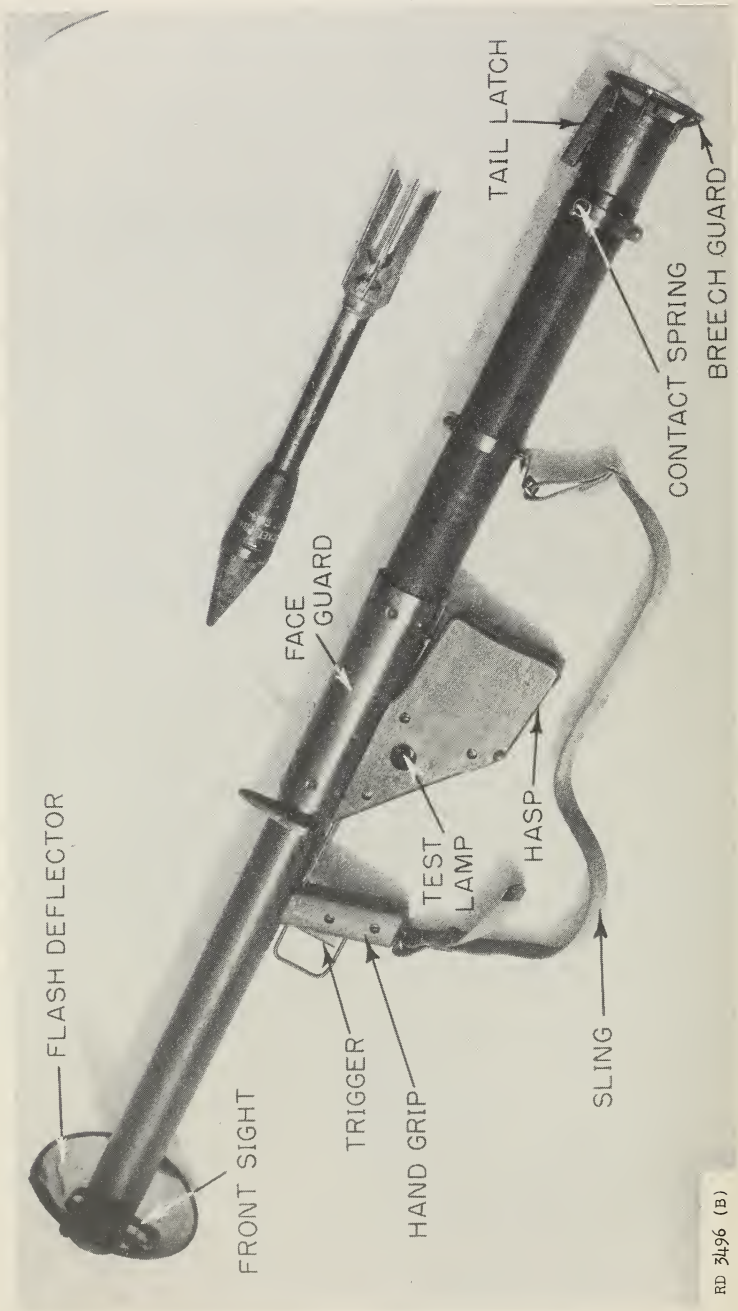

Figure 57.—2.36-inch AT Rocket Launcher M1A1—Left Side View.

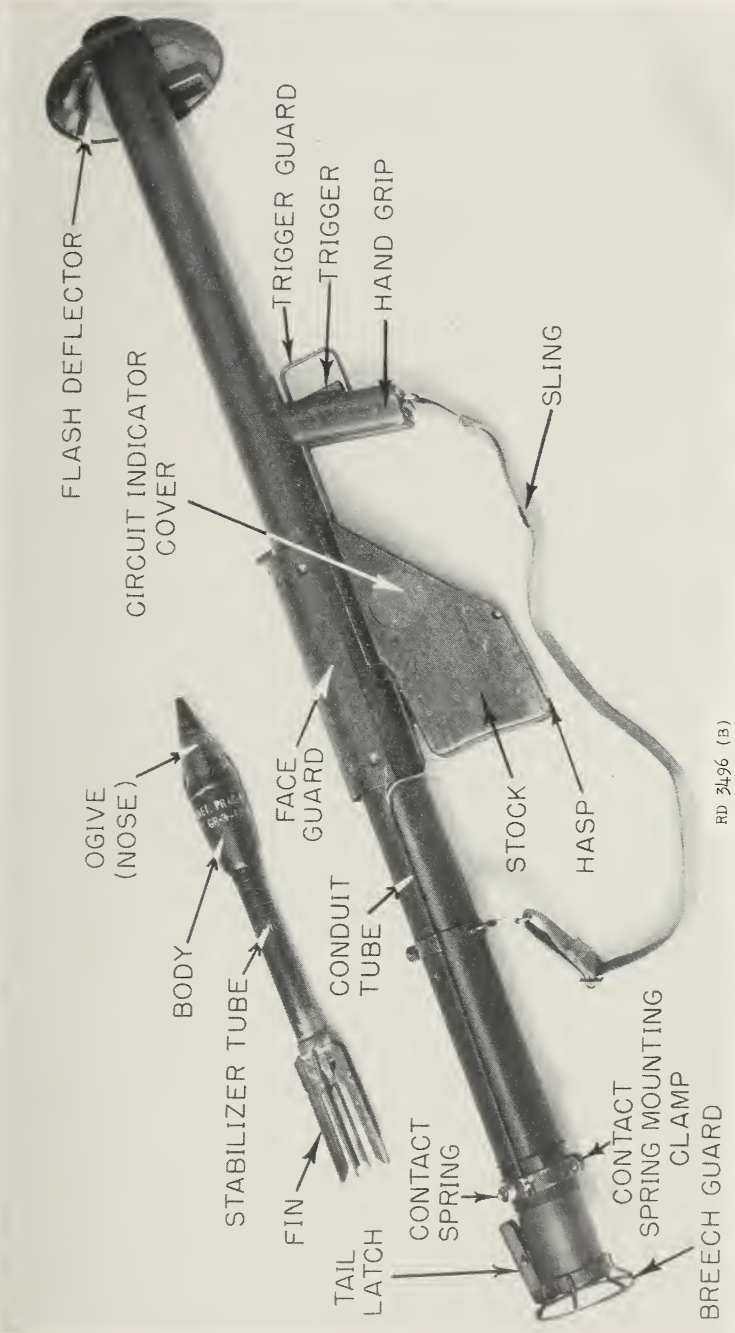

Figure 58.—2.36-inch AT Rocket Launcher M1A1—Right Side View.

c. **Sights.**—The M1A1 launcher has a front and rear sight, both of which are fixed to the barrel on the left side. The rear sight is of the peep type. The front sight consists of three studs which are used for ranges of 100, 200, and 300 yards. Intermediate or greater ranges, lead, and windage must be estimated by the firer.

Some of the earlier models of the AT Rocket Launcher, M1, had a double front sight with studs for ranges of 100, 200, 300, and 400 yards, and a hinged rear sight of the slot type so that the launcher could be fired from either the right or left shoulder.

3. **Ammunition Supply.**—a. The ammunition currently authorized for use in the M1A1 rocket launcher is as follows:*

Rocket, HE, AT, 2.36-inch, M6A3; Rocket, HE, AT, 2.36-inch, M6A1.

Rocket, practice, 2.36-inch, M7A3; Rocket, practice, 2.36-inch, M7A1.

* **NOTE:** HE—High Explosive; AT—Antitank; M—model number; A—modification number.

b. The ammunition issued for the M1 launcher was known as the M6 and M7 Rockets. These cannot be used in the M1A1 launcher.

c. The unit of fire is five rockets per launcher.

d. Rockets may also be buried in the ground as antitank mines.

4. **Employment.**—The rocket launcher is used in combat to launch high-explosive rockets against tanks, armored vehicles, pill boxes, and emplacements. It is operated by a two-man team, one to fire and one to load the weapon. In order to achieve greater accuracy and assist in effecting surprise, fire against moving targets should be withheld until the last practicable moment. Where terrain favors a hostile tank attack, the launchers should be near that part of the company most threatened by such an attack. During reorganization after an attack, and in the defense, they should be placed near the perimeter of the company to cover the most likely avenues of mechanized approach. The company commander will coordinate the use of the rocket launchers with any other antitank protection furnished his company.

5. **Precautions.**—Three major precautions must be observed in using this weapon and its ammunition:

a. No personnel or inflammable material should ever be directly behind the loaded launcher within a distance of 20 feet. When the rocket is fired, there is considerable back blast which can cause serious burns. When firing from trenches or fox-holes, clearance should be provided so that the back blast is not deflected against personnel.

b. If no flash deflector is available, the firer should have his hands and face protected against possible backflash as the rocket leaves the muzzle of the launcher, especially in cold weather when combustion of the propelling charge may be retarded. Both the loader and firer should wear steel helmets when using the launcher.

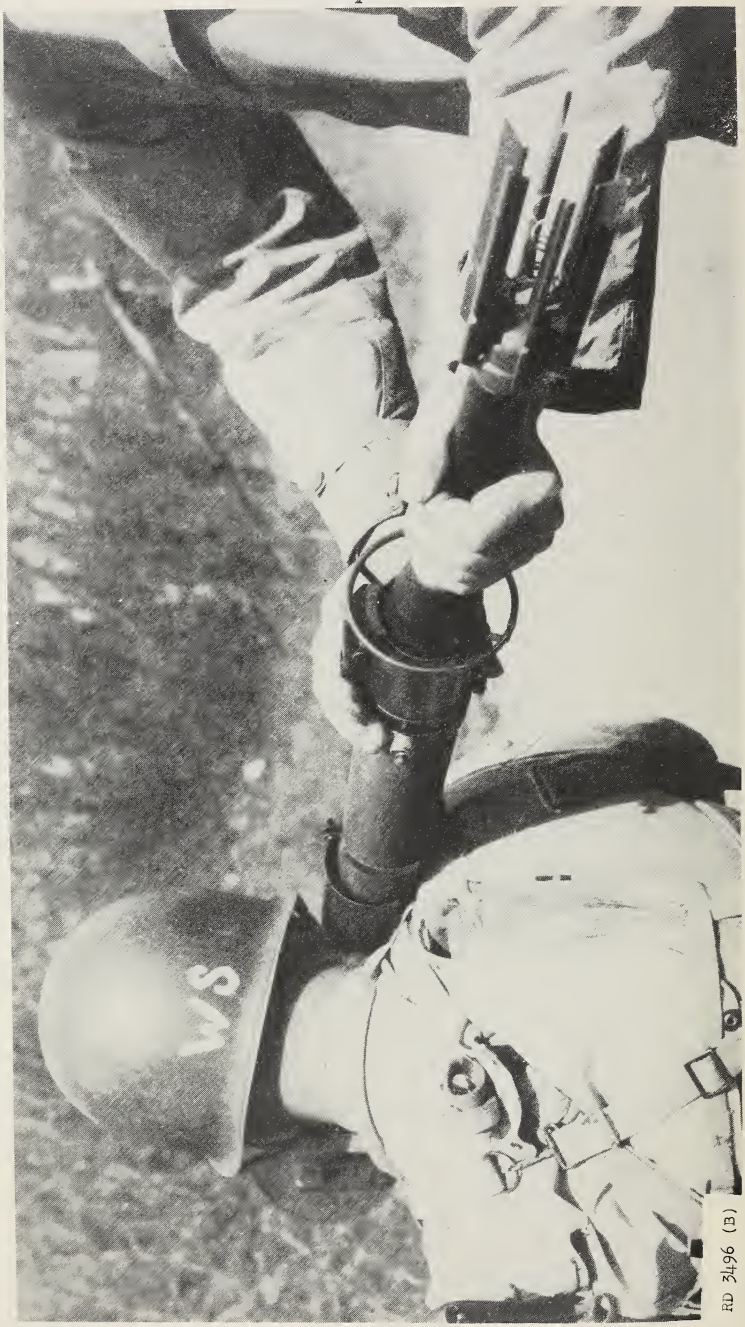

Figure 59.—Loading the Rocket Launcher.

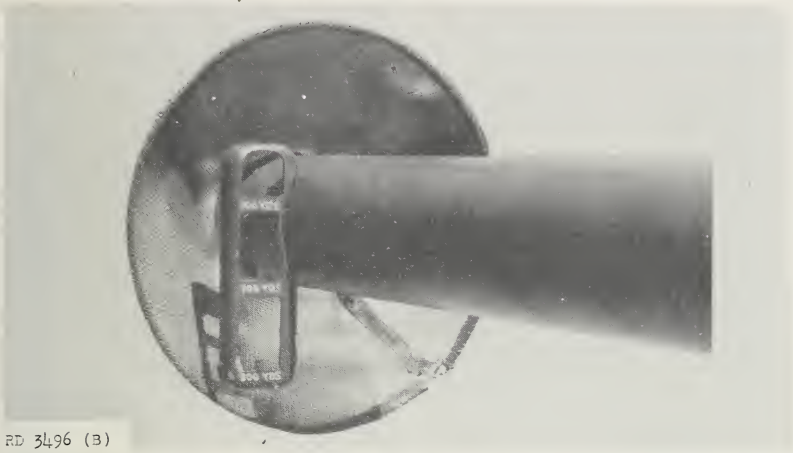

Figure 60.—Front Sight and Flash Deflector of Rocket Launcher.

Figure 62.—High Kneeling Position.

Figure 61.—Standing Position.

Figure 63.—Low Kneeling Position.

Figure 64.—Sitting Position.

Figure 65.—Prone Position.

c. General precautions to be taken in handling the rockets are to keep them out of direct sunlight except when immediately ready to load; to handle them carefully and not drop them after the safety pin has been removed; to avoid allowing a rocket to remain in a hot launcher prior to firing, and to avoid attempting to fire the rockets at temperatures below zero degrees F or above 120 degrees F.

Below 14° F, the dry cell batteries which furnish the electric current for firing this weapon become too weak to function. Under these conditions, they must be removed and kept warm until ready to fire.

SECTION 18

JOHNSON LIGHT MACHINE GUN, CAL. .30, M1944

1. **General.**—An older model (M1941) of the Johnson Light Machine Gun has been used on a limited scale by certain parachute and raider units of the Marine Corps. On the basis of reports by these units and of subsequent tests on it and on the M1944, it has been recommended that this weapon be adopted as part of the organic armament of Marine Corps infantry units, provided certain changes and modifications are made.

2. **Essential Characteristics.**—a. **Description.**—The Johnson Light Machine Gun, Cal. .30, M1944, is an air-cooled, recoil-operated, clip- or magazine-fed shoulder weapon, capable of firing automatic or semiautomatic fire.

b. **General data.**—

NOTE: All figures given are approximate only, since certain changes are yet to be made in the weapon.

Weights:

Gun with magazine, without sling	(pounds)	17+
Empty magazine	(pounds and ounces)	1-4
Full magazine (20 rounds)	(pounds and ounces)	2-4
Barrel	(pounds and ounces)	2-12
Gun with full magazine (20 rounds), sling and cleaning kit	(pounds)	19½
Over-all length of gun	(inches)	42½
Length of barrel	(inches)	22
Full cyclic rate of fire	(RPM)	600
Ranges for which sights are graduated	(yards)	0-2,000

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Figure 66.—Johnson Light Machine Gun, Cal. .30, M1944—Left Side View.

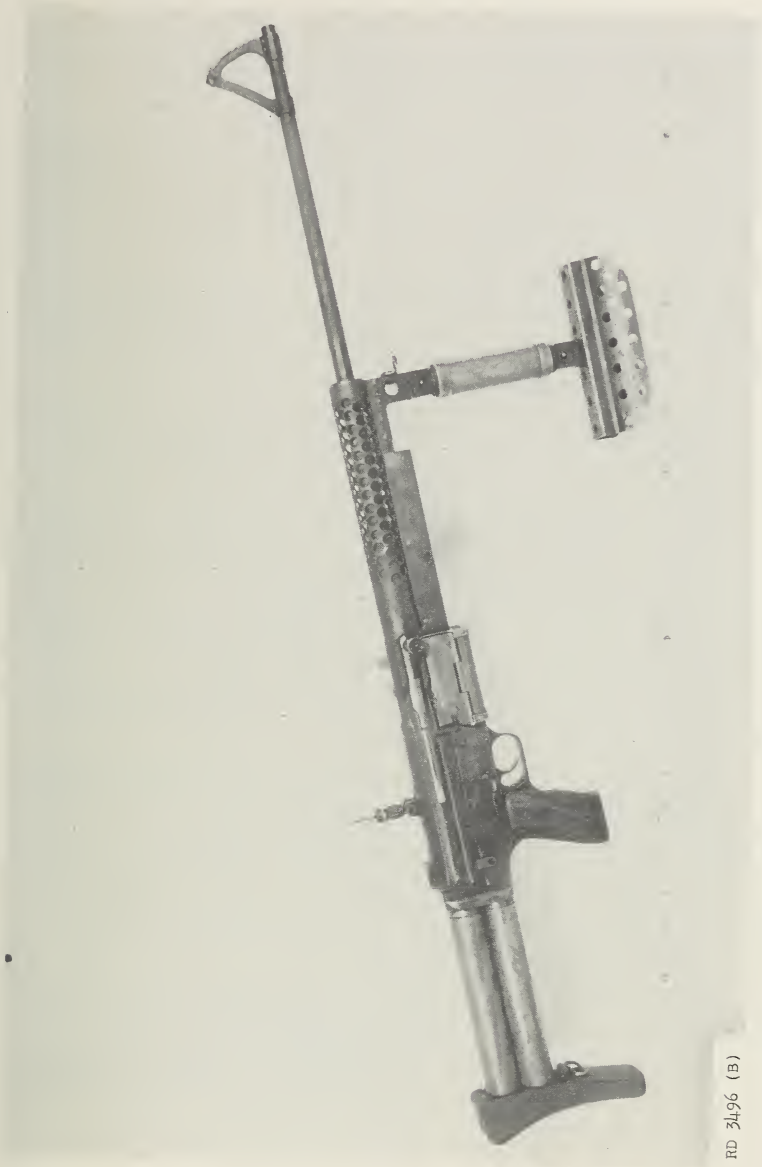

Figure 67.—Johnson Light Machine Gun, Cal. .30. M1944—Right Side View.

c. **Loading.**—The loaded magazine is inserted in the housing on the left side of the gun. A loading gate is also provided on the right side of the gun. Single shots or Springfield (5-round) clips may be inserted into the gate from the right-hand side and forced through into the magazine. This unique feature permits reloading (or emptying) a partly empty magazine without detaching it; in addition, it is possible to introduce a few rounds of tracer ammunition when necessary, at the same time keeping a magazine loaded with ball cartridges ready for immediate firing.

d. **Other features.**—The Johnson Light Machine Gun is so designed that all moving parts reciprocate along the axis of the bore. This feature practically eliminates all tendency for the weapon to "climb" when being fired automatically from the shoulder, and makes for a high degree of accuracy.

Another feature is that this weapon may be fired from either a closed or an open bolt. Used as a semi-automatic weapon for accurate fire, the bolt is closed so that the heavy parts moving forward will not disturb the aim. When the trigger is pulled, one cartridge is fired; the gun is cocked and the bolt closed, ready for the next shot. When firing automatic fire, the bolt is open whenever fire is suspended, to permit cooling by air circulation and to prevent a cartridge in the firing chamber from being "cooked off" by the hot barrel. The bolt will stay open in this position; when the trigger is pressed, it goes forward and the cartridge is fired. The action repeats automatically until the trigger is released or the magazine is empty.

3. **Ammunition.**—This weapon fires the standard .30-caliber M1 or M2 cartridge used in rifles and other .30-caliber machine guns. The unit of fire for the earlier model used by parachute and raider units was 900 rounds for those organizations; it is likely that this will be reduced to a unit of fire similar to that of the BAR, if and when the new model is issued to regular infantry units.

4. **Employment.**—If adopted, the Johnson LMG will be used to give additional fire power to the rifle squads. The ability of this weapon to deliver both automatic and semi-automatic fire will enable it to be employed in a manner similar to the M1 rifle, the BAR, or the Browning Light Machine Gun.

SECTION 19

PORTABLE FLAME THROWER M1A1

1. **General.**—The portable flame thrower is an offensive weapon of limited use for special situations such as:

a. Assault upon fortifications, such as concrete, steel, timber, and earth emplacements, along with casualty effect on enemy personnel. This is the primary use.

b. Incendiary effect on buildings, supply dumps, and other inflammable structures.

c. Screening effect of smoke produced by liquid fuel.

d. Demoralizing effect upon enemy personnel.

e. Defense against tanks and in tank hunting.

f. Mopping up, forcing of entry, and other purposes.

2. **Essential Characteristics.**—a. **Description.**—The portable flame thrower consists of two major sections, the fuel unit and the gun unit.

(1) Fuel unit.—The fuel unit is carried upon the operator's back, supported by straps; it consists principally of the following parts:

(a) Two fuel tanks, joined together and holding 5 gallons of fuel.

(b) Pressure cylinder, charged with compressed air or compressed nitrogen to eject fuel from the tanks.

(c) Pressure regulator, which controls the amount of pressure delivered to the fuel tanks and includes a relief valve.

(d) Pressure cylinder valve, which releases pressure to the fuel tanks.

(e) Fuel valve and connectors, which control the flow of fuel to the gun.

(f) Tank carrier, which supports and secures the unit to the operator's back and shoulders, and includes a pad and straps.

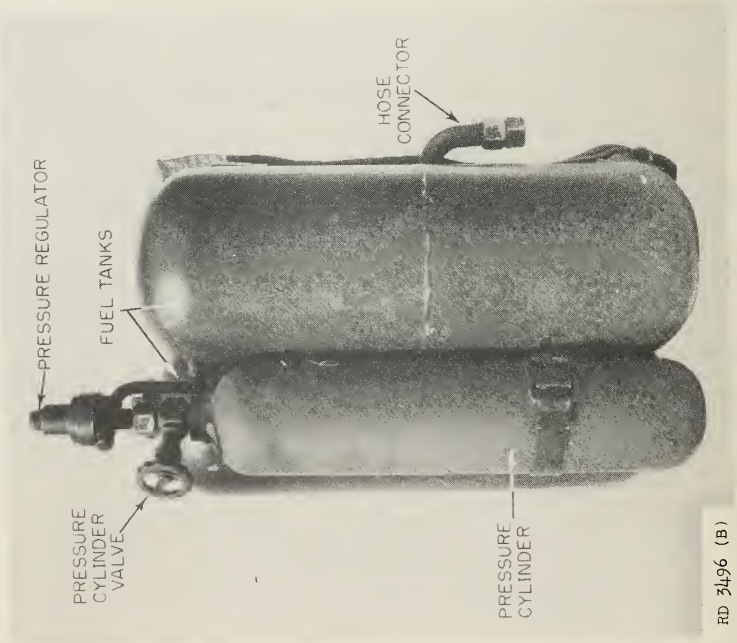

Figure 68.—Fuel Unit.

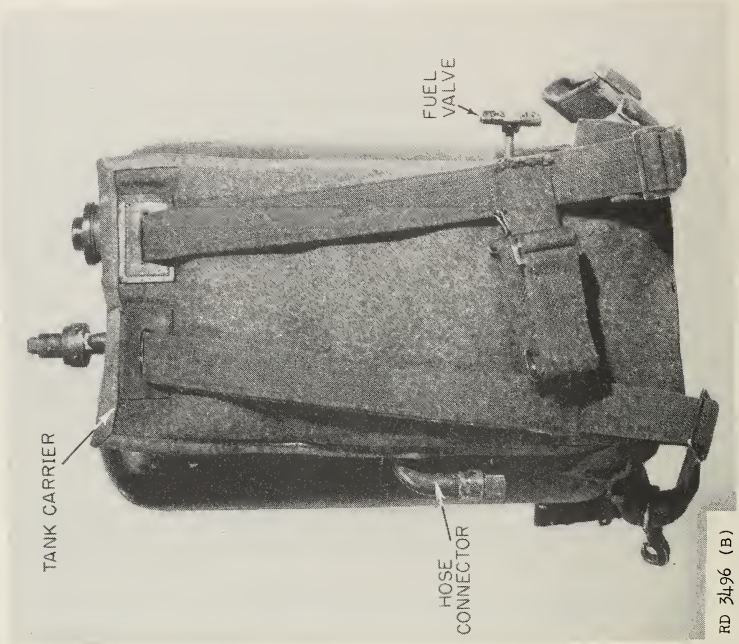

Figure 69.—Fuel Unit, Reverse View.

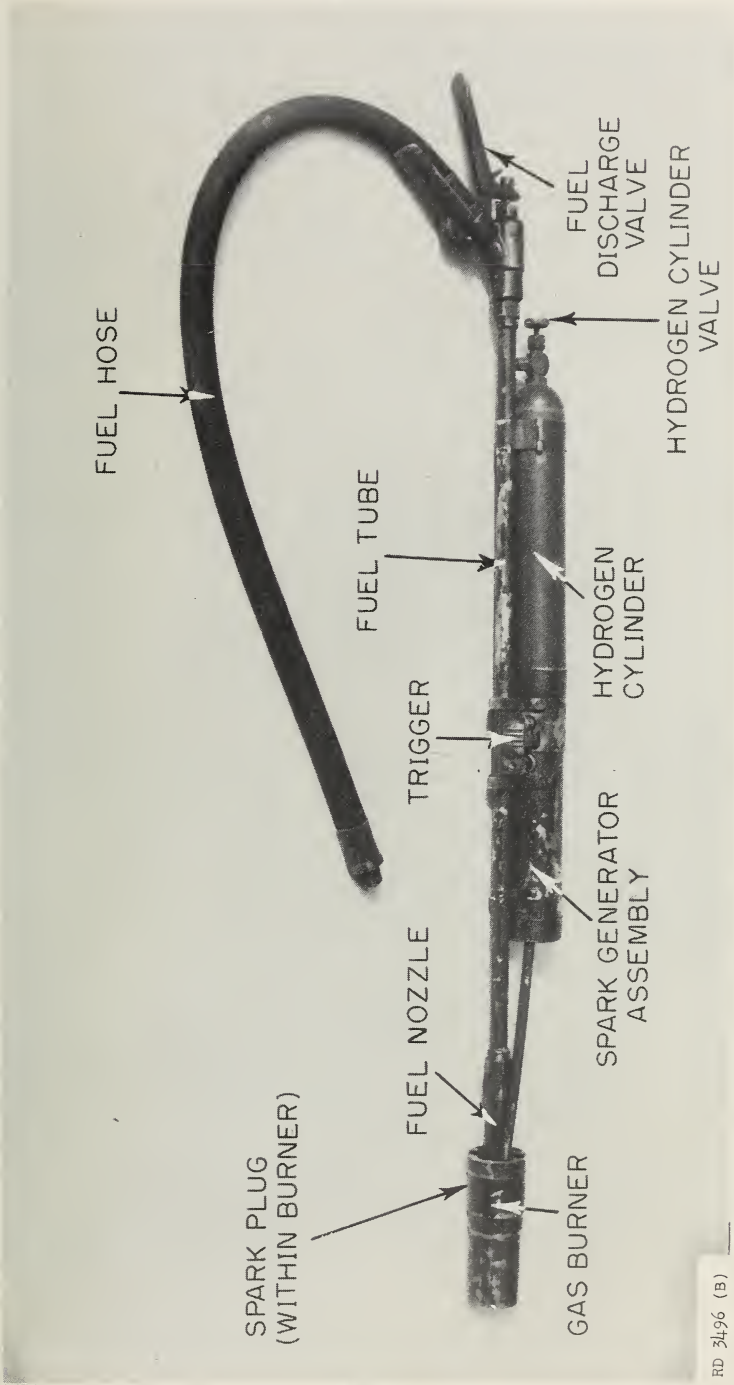

Figure 70.—Gun Unit.

(2) Gun unit.—The gun unit, which is held in the operator's hands and directed by him, ignites the fuel and projects it at and upon the target. It includes the following parts:

(a) A flexible fuel hose which conveys fuel from the fuel unit to the fuel discharge valve.

(b) Fuel discharge valve, which releases fuel to the fuel tube when the flame thrower is to go into action.

(c) Fuel tube, which conveys fuel to the nozzle, and which supports the hydrogen and electrical systems.

(d) Fuel nozzle, which projects the fuel through the gas burner.

(e) Gas burner, a chamber where the fuel is ignited as it passes through it from the nozzle.

(f) Hydrogen cylinder, valve, tubing, and burner head, which together deliver hydrogen gas to the gas burner.

(g) Spark generator assembly, which supplies electric current to the spark plug.

(h) Spark plug, which ignites the hydrogen, which in turn ignites the fuel in the gas burner.

(i) Trigger assembly, which when pressed releases both electricity and hydrogen for igniting the fuel.

(3) Variations.—Portable flame throwers, M1 and M1A1, are equipped with either the bent or the straight fuel tube. They originally differed only in the following particular: The M1 flame thrower was designed to use only liquid fuels. The M1A1 flame thrower was designed to use any permissible fuel. The M1 type, however, has now been re-equipped with the correct fuel discharge valves and pressure regulator parts to enable it to utilize thickened fuel. This re-equipment will serve to explain the persistence of the "M1" nameplate upon certain units of materiel now in use.

b. **General data.—**

Weights (in pounds):

Complete apparatus, empty	32
Complete apparatus, filled (approximately)	68
Fuel unit, complete, empty	24
Fuel unit, complete, filled (approximate)	60
Gun unit, complete	8

Pressures (pounds per square inch):

Fuel tanks	375
Hydrogen cylinder	1,500-2,100
Pressure cylinder	1,800-2,000

Ranges (in yards):

Effective, with thickened gasoline	40-50
Maximum, with thickened gasoline	60-80
Effective with fuel oil, Diesel oil, light lubricating oil, cleaned crankcase drainings	15-20

c. **Duration of fire.**—When discharged, the portable flame thrower will maintain a continuous or intermittent fire for a period of approximately 10 seconds, not including time between bursts.

3. **Fuel.**—A simple adjustment permits the portable flame thrower to utilize either the thickened gasoline or various types of liquid oils and blends. The fuel must be heavy enough to prevent spraying when it leaves the nozzle, yet light enough to obtain maximum range. It must not be so highly volatile that it will burn completely before reaching the target, nor must it contain such low volatile qualities that it will be difficult to ignite. A lighter fuel should be used in cold weather than in hot weather. Two blended fuels which have been found satisfactory are: (1) Equal parts by weight of gasoline, kerosene, and No. 6 fuel oil; and (2) a mixture of gasoline with crank-case drainings to give the proper weight and volatility (10 to 20 per cent gasoline by volume gives good results). Used crank-case oil should be strained through cheesecloth or a No. 30 wire-mesh screen before being used in a flame thrower.

4. **Employment.**—a. **Carrying the fuel unit.**—The fuel unit is supported on the back and secured to it by two shoulder straps, a chest strap, and a waist strap. The carrier back cushions the load. The straps may be adjusted to fit the operator by means of tongueless bar buckles. The shoulder straps pass over the shoulder and under the arm pits. The waist straps are clasped tightly in the front and center of the body. The chest straps, clasped across the chest, help prevent the shoulder straps from slipping and the fuel unit from rolling off the back. Adjustments in the various straps should be made until the unit is carried with the lower fuel tank brace at the small of the operator's back. The fuel unit should fit snugly so that it will not shift when the operator changes from standing to kneeling or prone positions.

b. **Carrying the gun unit.**—The firer carries the gun with the fuel hose at his right side. He grasps the gun near the fuel discharge valve with his right hand and near the trigger with his left hand.

c. **Firing positions.**—The flame thrower can be fired from any position that permits sufficient freedom to aim the weapon and sufficient stability to withstand the recoil of the weapon. Kneeling is the easiest position from which to fire, and is used when considerations of concealment and cover permit. The prone position permits a maximum of concealment and cover under most circumstances, but should not be used when the firer's head is lower than his feet. When firing from the standing position, the firer leans into the gun. This position is similar in many respects to kneeling, but the left arm is not supported.

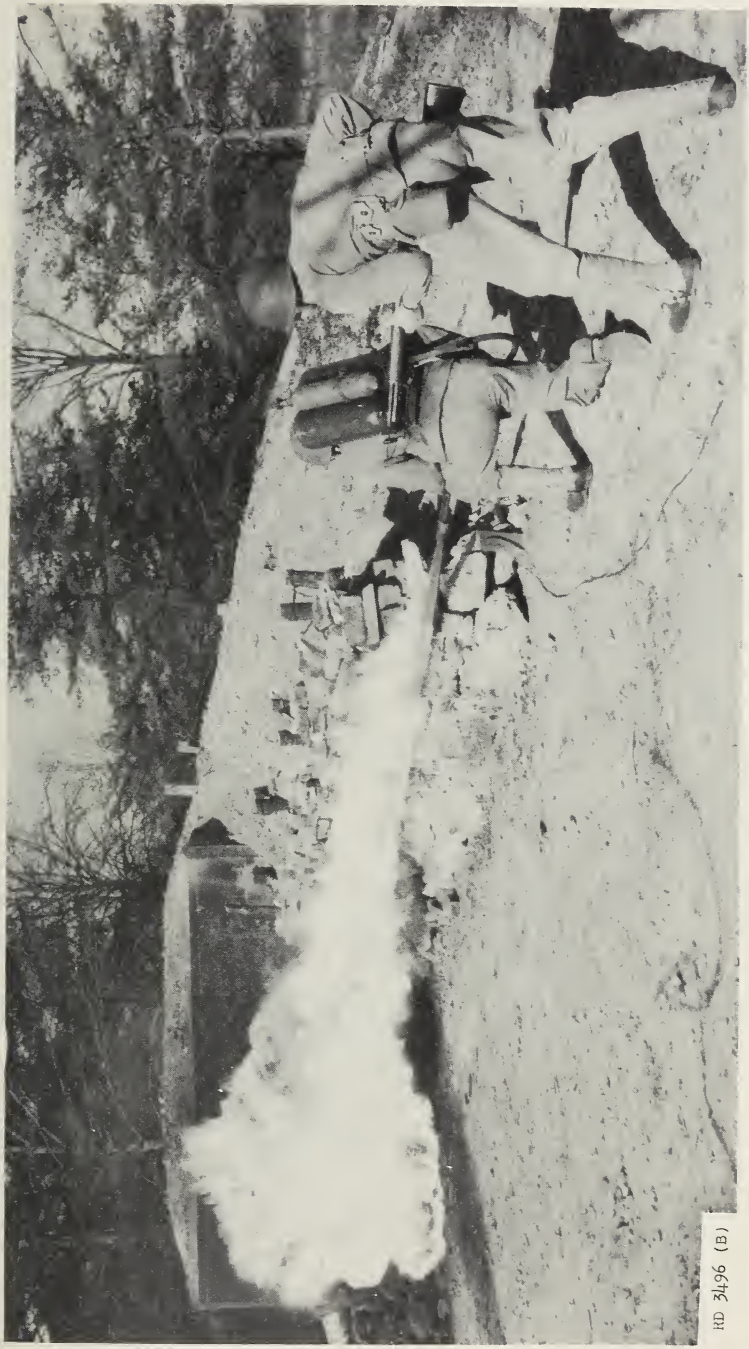

Figure 71.—Portable Flame Thrower in Use.

d. **Aiming technique.**—Because of the extremely short range at which it is fired, there are no sights on the flame thrower gun. The gun is not brought to the shoulder but rather is held waist or chest high at the right side of the firer. Its angle will depend upon the range. Changes in elevation are made by raising and lowering the right hand. Changes in traverse are made with the left hand. Aim should be as low as is consistent with hitting the target.

e. **Firing technique.**—Considerable training will be necessary before the individual achieves precision in using the flame thrower effectively. The firer must be able to estimate the range accurately, to estimate the angle of elevation of the gun necessary to hit the target, and to make proper allowances for the direction and velocity of the wind and for the type of fuel being used.

f. **Precautions.**—The general provisions of chemical warfare as given in the Chemical Warfare Technical Manual apply to the use of the flame thrower. Care in handling hydrogen, fuel, and in handling the flame thrower itself is essential. Rigid fire precautions must be followed when working with hydrogen and fuel. The flame thrower should be treated as a rifle or gun, for it is every bit as dangerous.

SECTION 20

INFANTRY DEMOLITION KIT M1

1. **General.**—The increasing use of explosives and demolitions in combat has resulted in the development of a small light-weight kit for carrying the supplies and equipment which will normally be used by a small infantry unit. This kit, which is known as the Infantry Demolition Kit M1, is issued on the basis of one per rifle squad where its use is indicated, and may be carried by any designated member of the squad.

2. **Essential Characteristics.**—a. **Description.**—The fully equipped and supplied kit weighs approximately 17 pounds. It is roughly 13 inches square and 5 inches thick. The complete kit consists of two general groups: permanent equipment and expendable supplies.

b. **Permanent equipment:**

1 box, cap, 10-cap capacity (infantry).
1 box, match, waterproof, Watson or equal (complete with flint and tinder).
1 crimper, cap, with fuze cutter combination.
1 drill, detonating cord, handled.
1 case, canvas, for kit, demolition, infantry, M1.
1 knife, pocket, engineer, 4-blade, with clevis.

c. **Expendable supplies:**

1 two-ounce box cotton, absorbent.
10 lighters, fuze.
1 box matches, strike anywhere type, each box in waterproof container.
2 four-ounce rolls tape, friction, insulating, ¾-inch.
1 four-ounce ball twine, hemp.
10 pounds TNT, in half-pound blocks.
10 caps, blasting, nonelectric, #8.

To the above may be added variable lengths of time blasting fuze and of detonating cord (primacord) as may be needed under the circumstances.

Figure 72.—Infantry Demolition Kit M1.

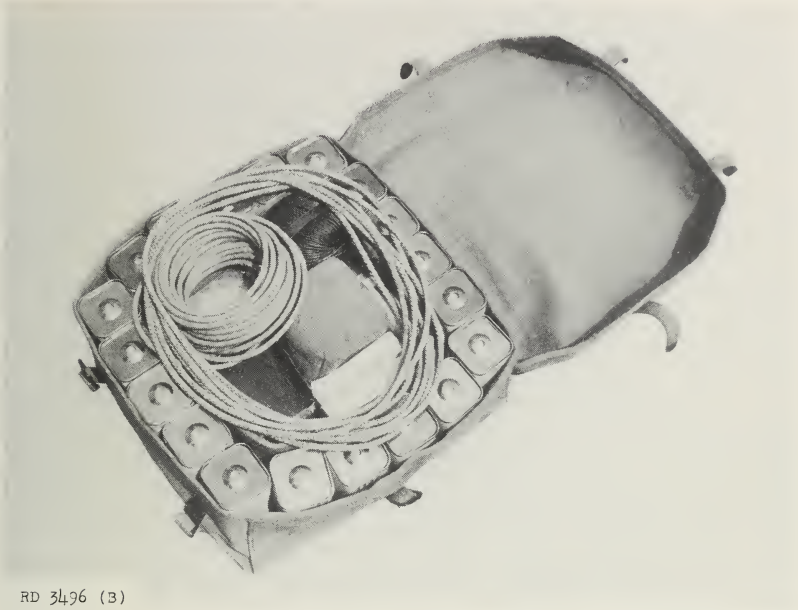

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Figure 73.—Contents of Infantry Demolition Kit M1.

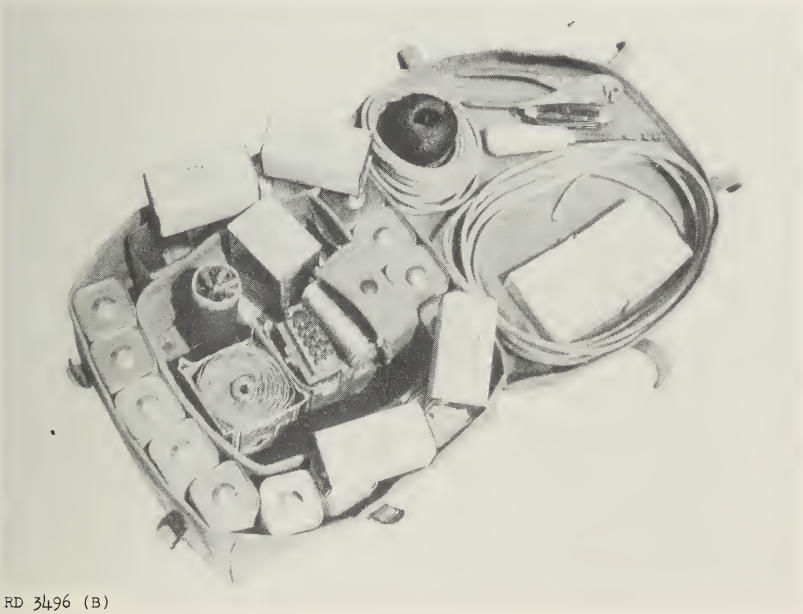

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Figure 74.—Display of Contents.

3. **Description of Items.**—a. **Cap box.**—Essentially, the cap box is merely a small block of wood with 10 holes bored in it, each hole of sufficient size to snugly accommodate one #8 blasting cap. The box is provided with a cover to keep the caps dry and to prevent their falling out.

b. **Waterproof match box.**—The waterproof match box is a short round metal tube with a screw cap. Its capacity is approximately 20 common household matches. As an additional feature, the box has a strip of flint sandpaper on the bottom which will produce sparks when struck with a metal object such as the knife blade. Some cotton-like tinder is provided so that sparks may be held long enough to ignite the fuze, in case no matches are available.

c. **Cap crimper.**—The cap crimper is designed to squeeze the copper shell of the nonelectric cap tight enough around the time fuze to prevent its being pulled off easily, and yet not tight enough to interfere with the burning of the powder train in the fuze. The lower portion of the jaws of the crimper are shaped and sharpened for cutting fuze. One leg of the handle is pointed for punching holes for caps in the blocks of TNT (or in dynamite cartridges). The other leg has a screwdriver end.

The cap crimper is about 7 inches long. It is made of relatively soft metal and must not be used as pliers. The cutting jaws must be kept clean and must not be used for cutting wire, nor for any other purpose than cutting fuze or detonating cord.

d. **Detonating cord drill.**—The detonating cord drill is used to drill a larger hole in a TNT block suitable for inserting primacord to detonate the block of explosive. It consists of a metal bit with a wooden handle attached.

e. **Carrying case.**—The carrying case is made of heavy canvas, similar in weight and color to that used in the regulation Marine Corps pack. The cover fastens down with web straps and buckles to secure the contents. Two adjustable web straps, with hooks attached, are provided for carrying purposes.

Figure 75.—Crimping the Nonelectric Blasting Cap to the Fuze.

f. **Engineer pocket knife.**—The knife is similar in design to the well-known Boy Scout pocket knife; it has two cutting blades, one punch, and one can opener; a clevis is on one end so that the knife may be tied to the belt for safekeeping.

g. **Cotton.**—A two-ounce roll of cotton is included in the kit for stuffing in the ears of persons who may be close to the explosions when they take place.

h. **Fuze lighters.**—The fuze lighter is a paper tube containing friction powder and a mechanical means of igniting the powder. The open end when placed over the time fuze is held in place by teeth inside the fuze lighter. These teeth are so inclined that they permit the fuze to enter, but prevent its removal except by force. A pull on the loop, or handle, provided at the closed end ignites the powder, which in turn fires the powder train in the fuze. Fuze lighters are especially useful for lighting fuzes in the wind and making trap mines. The trip wire of the mine pulls the handle of the fuze lighter.

i. **Matches.**—A box of ordinary household matches, sealed in a waterproof container, is included as an alternate method of lighting the time fuze. When a match is used, the fuze is split and the head of an unlighted match placed in the powder train. The head of the match is left protruding slightly, and is ignited by drawing the abrasive side of a matchbox across it. Merely holding a lighted match against the end of the fuze will not ordinarily ignite it.

j. **Tape and twine.**—Tape and twine are included in the demolition kit for such purposes as securing caps to primacord, fixing charges of the explosive in place, tying or taping blocks of TNT together to form concentrated charges, and constructing pole charges and improvised hand grenades.

k. **TNT.**—TNT is a powerful high explosive having a speed of detonation of about 21,000 feet per second. Its primary use is in cutting and breaching charges. It is relatively insensitive to shock and will not explode when struck by a single rifle bullet, although it will explode if struck by repeated machine-gun or rifle fire. It is insoluble in water, and may be used in underwater charges. It is not recommended for use in closed spaces, because its explosion produces poisonous gases. TNT can be burned in the open in small quantities without exploding; burned in confinement or in large quantities, it explodes.

The half-pound block of TNT found in the demolition kit is inclosed in a yellow cardboard container closed at both ends with lacquered tin. The container is 1 29/32 inches square by 3 11/16 inches long. At one end of the block is a cylindrical hole, 2 1/8 inches deep, to receive the blasting cap.

l. **Blasting caps.**—No. 8 nonelectric blasting caps are issued for the purpose of priming and detonating explosive charges. Nonelectric caps are extremely difficult to make waterproof; therefore, they should not be used for priming charges to be placed under water or in damp boreholes. Such charges may be detonated by priming them with detonating cord and fastening the nonelectric cap to the detonating cord above the water or ground level.

Caps are extremely sensitive, and are subject to detonation unless care is exercised in handling them. They must be protected from shock and extreme heat, and must not be tampered with. They are never stored with other explosives.

m. **Time blasting fuze.**—Time fuze contains black powder tightly wrapped with several layers of fabric and waterproofing materials. Its purpose is to transmit the flame which fires the explosive charge in a nonelectric cap. By burning slowly at a uniform rate, it allows the person firing a charge to reach a place of safety before the charge explodes. All fuze in any roll burns at a uniform rate, but the rate of burning of different rolls my vary between 30 and 45 seconds per foot. For this reason, each roll of fuze should be tested before use by timing the burning of a one-foot length.

Time fuze is issued in rolls of 50 feet each. The external covering is relatively smooth and may be any one of several colors, although white and orange are most commonly issued. It should be stored in a cool, dry place free form oils, paints, gasoline, kerosene, and similar distillates and solvents. In handling the fuze, care must be taken to avoid twists, kinks, or sharp bends, which may crack the covering or cause breaks in the powder train of the fuze.

n. **Detonating cord (primacord).**— Detonating cord contains high explosive in a greenish-yellow, waterproof textile covering which has a relatively rough, waxy finish. The explosive used to make up the cord is PETN (pentaerythritetetranitrate). Detonating cord is insensitive to friction and ordinary shock, although it may be detonated by rifle fire if several strands are in intimate contact with each other. Detonating cord is not ignited, like time fuze, but must be detonated by a blasting cap. Primacord detonates at the rate of about 20,000 feet per second and with sufficient violence to cause detonation of other explosives to which it is properly fastened. It is used in making primers for demolition charges and for the simultaneous explosion of a number of charges.

4. **Employment.**—a. **Pole charges.**—In the attack of a strongly fortified position such as a concrete, steel, timber, or earth emplacement of the pillbox or bunker type, a few men may be designated as a demolition team to place a charge of explosives against an embrasure. Placing such charges is

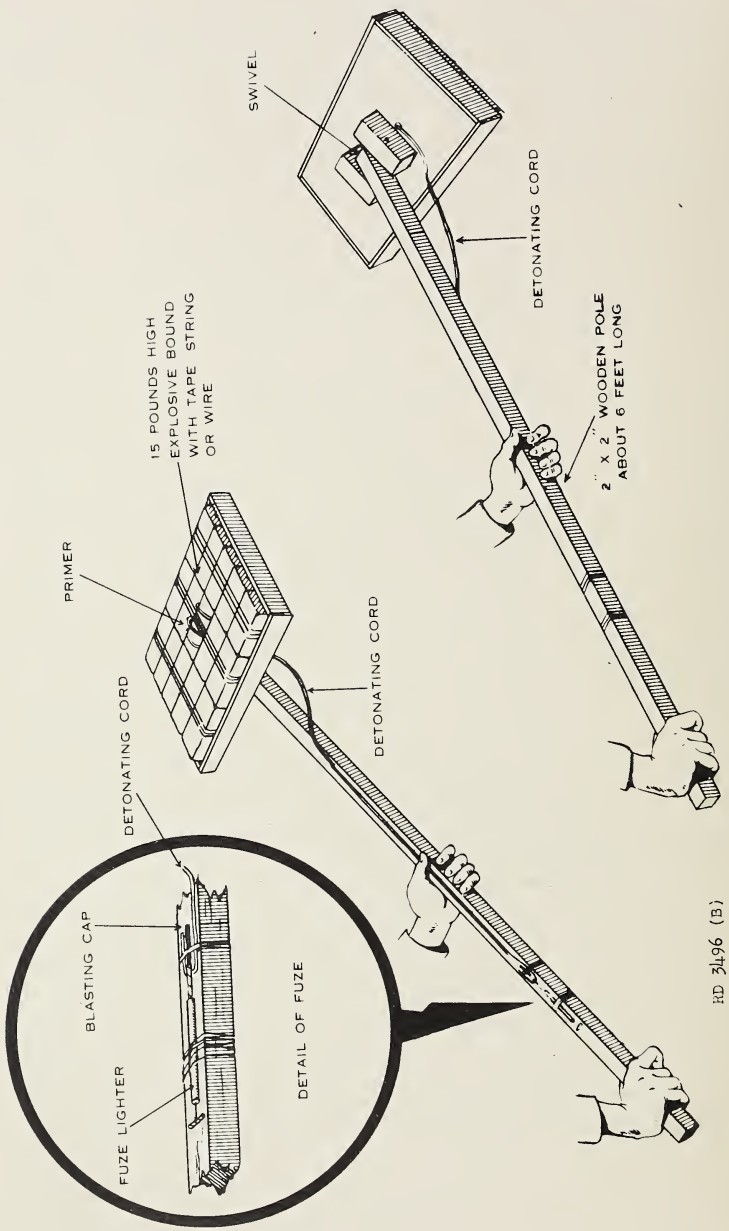

Figure 76.—Details of Construction of a Pole Charge.

greatly facilitated if they are prepared in advance by making the explosive blocks into convenient packages of the proper size and shape. For convenience, the placing of the charge is often accomplished by using a pole; the charge is fastened securely to one end, which is placed against the embrasure or other critical point, and the free end of the pole is anchored by forcing it into the ground. This will hold the charge tightly up against the structure. Pole charges may also be used against inaccessible stringers of bridges, under water against piles of bridges, and in other locations not easily accessible. Charges are always double-primed to insure their detonation.

b. **Other uses.**—A small unit carrying one or more demolition kits may also be assigned such missions as the following:

(1) Railroad track destruction.—Tracks may be destroyed by exploding small charges at switch points, frogs, crossings, and at other points, particularly on curves and in tunnels.

(2) Disabling rolling stock.—The same parts on all locomotives and cars are destroyed, so that parts cannot be interchanged. To accomplish the task thoroughly, men should be detailed to destroy definite parts. The following information is a guide for placing charges to disable locomotives:

(a) Two ½-pound blocks of TNT will break a reverse lever or side rod.

(b) Three ½-pound blocks of TNT will break a cylinder.

(c) Three ½-pound blocks will break a driver, if charge is placed near bearing spring.

(d) If engine is cold, boiler may be ruptured by placing three ½-pound blocks inside.

(e) Three ½-pound blocks in bottom of tank will rupture a tender.

(3) Water, oil, and gasoline storage tanks.—Two-pound charges placed against or near the bottom of a tank will perforate it in most cases. In the case of oil or gasoline, provision should be made for setting the escaping fuel on fire.

(4) Cutting of trees and telephone, telegraph, or power line poles.—Charges varying in size with the diameter of the timber provide a rapid and effective means of cutting down trees or poles for the purpose of creating road blocks and cutting communication facilities.

(5) Destroying shells and bombs.—Unexploded high-explosive shells and bombs may be destroyed by placing a small charge of TNT next to them. If possible, this should be accomplished only under the supervision of an engineer or ordnance officer.

(6) Clearing obstacles.—Explosives are often used to clear gaps in wire entanglements, mine fields, and other types of obstacles.

(7) Improvised hand grenades.—Single blocks of TNT may be used for their concussion effect in small closed places, such as pillboxes and bunkers. A fragmentation hand grenade may be improvised by tying or taping nails, bolts, and other small pieces of scrap metal to a block of TNT.

(8) Booby traps.—The materials in the demolitions kit may be combined in almost any number of ways to improvise booby traps.

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